



**CONESTOGA-ROVERS
& ASSOCIATES**

2055 Niagara Falls Blvd., Suite #3
Niagara Falls, New York 14304
Telephone: (716) 297-6150 Fax: (716) 297-2265
www.CRAworld.com

MEMORANDUM

To: Michael Berkoff, USEPA

US EPA RECORDS CENTER REGION 5



REF. NO.: 056393-08

FROM: Greg Carli/Jodie Dembowske/27

DATE: January 8, 2014

CC: 12th Street Landfill Technical Team

Richard Gay, Weyerhaeuser NR Company; Kristi Zakrzewski,
MDEQ; John Bradley, MDEQ

RE: October 2013 Quarterly Groundwater Sampling Results

12th Street Landfill-Operable Unit No. 4 - Allied Paper/Portage Creek/Kalamazoo River Superfund Site,
Otsego Township, Michigan

This memorandum has been prepared by Conestoga-Rovers & Associates (CRA) to summarize the results of the October 2013 quarterly groundwater sampling event performed at the 12th Street Landfill, Operable Unit No. 4 – Allied Paper/Portage Creek/Kalamazoo River Superfund Site, located in Otsego Township, Michigan between October 14th and October 16th, 2013.

The October 2013 sampling event was performed as part of the Operation, Maintenance, and Monitoring (OM&M) activities at the Site. The most recent sampling event prior to this was the July 2013 semiannual event.

A total of 15 groundwater monitoring wells (MW-101S, MW-101D, MW-102S, MW-102D, MW-103D, MW-104S, MW-104D, MW-105S, MW-105D, MW-106S, MW-106D, MW-107S, MW-108S, MW-108D, and MW-109D) were installed in February 2011, at varying depths, around the perimeter of the landfill to complete the OM&M monitoring well network. The locations of the monitoring wells are shown on Figure 1. Prior to the October 2013 sampling event, CRA collected static water levels for 2 weeks from each well and the river staff gauge, as required by the OM&M Plan (December 2012). Monitoring well construction details and groundwater elevations from the water level collection events are presented in Table 1. Figure 2 presents the shallow groundwater elevation contours, and Figure 3 presents the deep groundwater elevation contours, both from the pre-sampling water level event on October 14, 2013.

During the October 2013 groundwater sampling event, samples were collected from each monitoring well in the monitoring well network. Field measurements of pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), conductivity (mS/cm), temperature (Deg C), and turbidity (NTU) were collected. Samples were collected using low flow sampling and submitted for laboratory analysis of target compound list (TCL) volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and target analyte list (TAL) for inorganics and cyanide.

The October 2013 analytical results were compared to Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria, identified by Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD), updated December 30, 2013, pursuant to 1994 PA 451, as amended. The October 2013 analytical results and field parameters are presented in Table 2.

The analytical results of the October 2013 sampling event yielded only mercury exceeding relevant Part 201 Cleanup Criteria at one monitoring well. The groundwater surface water interface (GSI) criterion of 0.0013 micrograms per liter ($\mu\text{g}/\text{L}$) for mercury was exceeded at MW-106S (0.00495 $\mu\text{g}/\text{L}$). Mercury in groundwater reported below 200 ng/L (0.2 $\mu\text{g}/\text{L}$) is considered de minimis per the Michigan Department of Environmental Quality (MDEQ) policy and procedure document Number 09-014 *Evaluating Mercury in Groundwater Plumes Relative to the Groundwater Surface Water Interface (GSI) Pursuant to Part 201*, June 20, 2012.

Analytical results from groundwater monitoring events completed at the Site between October 2011 and October 2013 have exceeded GSI criteria for arsenic, cyanide and mercury during various sampling events. Figure 4 shows the analytical results for these parameters for each of the sampling events conducted between October 2011 and October 2013. PCB detections from each of the nine sampling events are also included on Figure 4.

The following summarizes the October 2013 analytical results:

- VOC parameters reported were estimated values below the method detection levels, and well below GSI criteria
- PCB parameters reported were estimated values, well below the GSI criteria
- Mercury was detected at MW-106S above the GSI criteria
- Cyanide was not reported above the detection level

Groundwater monitoring will continue at the Site as described in the OM&M Plan, approved by the United States Environmental Protection Agency (USEPA) on May 23, 2013, as amended by the November 7, 2013 approval by the USEPA, in concurrence with the MDEQ, to discontinue low-level mercury sampling. Groundwater samples for mercury analysis will follow USEPA method 245.1 beginning in 2014.

The next groundwater sampling event will be scheduled to occur in February 2014 and will consist of a semiannual event as outlined in the OM&M Plan [i.e., TCL VOCs, SVOCs, PCBs, total analyte list (TAL) metals, and polychlorinated dibenzodioxins/polychlorinated dibenzofurans (PCDD/PCDF)]. Hexavalent chromium will be collected during this sampling event. Per the conditional approval (November 27, 2013) of the revised Multi-Area Quality Assurance Project Plan (QAPP), samples will be submitted to the ALS laboratory in Holland, Michigan.

TABLE 1

Page 1 of 2

GROUNDWATER MONITORING WELLS
OCTOBER 2013 WATER LEVEL DATA
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Locations	Ground Surface Elevation (feet AMSL)	Reference Elevation (feet AMSL)	Monitoring Well Depth (feet bgs)	Screened Interval (feet AMSL)	October 2013 Water Level Data Depth to Water (feet bgs)						
	30-Sep-13	2-Oct-13	4-Oct-13	7-Oct-13	9-Oct-13	11-Oct-13	14-Oct-13				
MW-101S	734.35	737.46	39	702.35 to 695.35	36.40	36.44	36.53	36.31	36.35	36.38	36.49
MW-101D	734.33	737.14	75	664.33 to 659.33	36.10	36.14	36.23	36.02	36.04	36.08	36.18
MW-102S	704.18	707.36	10	701.18 to 694.18	6.24	6.29	6.36	6.83	6.18	6.23	6.33
MW-102D	704.43	707.43	45	664.43 to 659.43	6.28	6.32	6.39	6.15	6.22	6.25	6.38
MW-103D	704.37	707.36	35	674.37 to 669.37	6.93	7.05	7.01	6.18	6.91	6.96	7.08
MW-104S	703.86	706.55	25.5	684.86 to 677.86	6.75	6.82	6.76	6.59	6.68	6.72	6.86
MW-104D	703.48	706.42	45	663.48 to 658.48	6.57	6.64	6.70	6.42	6.50	6.55	6.69
MW-105S	704.89	707.86	12	699.89 to 692.89	8.28	8.35	8.33	8.14	8.23	8.26	8.43
MW-105D	704.78	707.89	47	662.78 to 657.78	8.08	8.12	8.22	7.97	8.02	8.06	8.26
MW-106S	703.88	706.96	9	701.88 to 694.88	7.51	7.55	7.67	7.38	7.44	7.47	7.69
MW-106D	703.66	706.36	45	664.66 to 659.66	6.72	6.76	6.92	6.64	6.67	6.71	6.94
MW-107S	703.76	706.73	13	695.76 to 690.76	6.97	7.03	7.22	6.91	6.95	6.97	7.23
MW-108S	703.32	706.21	9	701.32 to 694.32	6.30	6.37	6.52	6.22	6.27	6.29	6.53
MW-108D	703.39	706.16	45	663.39 to 658.39	6.31	6.36	6.56	6.25	6.28	6.31	6.55
MW-109D	707.41	710.46	23	689.41 to 684.41	9.93	9.96	10.10	9.83	9.87	9.90	10.07
SG-101	698.45	703.33	-	-	9.42	9.39	9.17	9.51	9.46	9.44	9.14

Notes:

Indicates that water level in monitoring well is lower than the river elevation

feet AMSL - feet above mean sea level

feet bgs - feet below ground surface

TABLE 1

Page 2 of 2

GROUNDWATER MONITORING WELLS
OCTOBER 2013 WATER LEVEL DATA
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Locations	Ground Surface Elevation (feet AMSL)	Reference Elevation (feet AMSL)	Monitoring Well Depth (feet bgs)	Screened Interval (feet AMSL)	October 2013 Water Level Data						
					30-Sep-13	2-Oct-13	4-Oct-13	7-Oct-13	9-Oct-13	11-Oct-13	14-Oct-13
MW-101S	734.35	737.46	39	702.35 to 695.35	701.06	701.02	700.93	701.15	701.11	701.08	700.97
MW-101D	734.33	737.14	75	664.33 to 659.33	701.04	701.00	700.91	701.12	701.10	701.06	700.96
MW-102S	704.18	707.36	10	701.18 to 694.18	701.12	701.07	701.00	700.53	701.18	701.13	701.03
MW-102D	704.43	707.43	45	664.43 to 659.43	701.15	701.11	701.04	701.28	701.21	701.18	701.05
MW-103D	704.37	707.36	35	674.37 to 669.37	700.43	700.31	700.35	701.18	700.45	700.40	700.28
MW-104S	703.86	706.55	25.5	684.86 to 677.86	699.80	699.73	699.79	699.96	699.87	699.83	699.69
MW-104D	703.48	706.42	45	663.48 to 658.48	699.85	699.78	699.72	700.00	699.92	699.87	699.73
MW-105S	704.89	707.86	12	699.89 to 692.89	699.58	699.51	699.53	699.72	699.63	699.60	699.43
MW-105D	704.78	707.89	47	662.78 to 657.78	699.81	699.77	699.67	699.92	699.87	699.83	699.63
MW-106S	703.88	706.96	9	701.88 to 694.88	699.45	699.41	699.29	699.58	699.52	699.49	699.27
MW-106D	703.66	706.36	45	664.66 to 659.66	699.64	699.60	699.44	699.72	699.69	699.65	699.42
MW-107S	703.76	706.73	13	695.76 to 690.76	699.76	699.70	699.51	699.82	699.78	699.76	699.50
MW-108S	703.32	706.21	9	701.32 to 694.32	699.91	699.84	699.69	699.99	699.94	699.92	699.68
MW-108D	703.39	706.16	45	663.39 to 658.39	699.85	699.80	699.60	699.91	699.88	699.85	699.61
MW-109D	707.41	710.46	23	689.41 to 684.41	700.53	700.50	700.36	700.63	700.59	700.56	700.39
SG-101	698.45	703.33	-		690.61	699.42	699.20	699.54	699.49	699.47	699.17

Notes:

Indicates that water level in monitoring well is lower than the river elevation

feet AMSL - feet above mean sea level

feet bgs - feet below ground surface

TABLE 2

**SUMMARY OF OCTOBER 2013 GROUNDWATER ANALYTICAL RESULTS
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN**

Sample Location	<i>Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening</i>			MW-101D	MW-101S	MW-102D	MW-102S				
	Levels: Residential and Non-Residential Generic Cleanup Criteria⁽¹⁾										
	Residential	Non-Residential	Groundwater								
Sample Identification	Drinking Water^(a)	Drinking Water^(b)	Surface Water Interface^(c)	WG-56393-101613-MR-204	WG-56393-101613-MR-202	WG-56393-101513-MR-196	WG-56393-101513-MR-195				
Sample Date				10/16/2013	10/16/2013	10/15/2013	10/15/2013				
Sample Elevation (feet AMSL)				664.33-589.33	702.35-663.35	664.43-619.43	701.18-691.18				
Volatile Organic Compounds (VOCs)	Units										
Acetone	ug/L	730	2100	1700	20 U	20 U	20 U				
Benzene	ug/L	5	5	200	0.50 U	0.50 U	0.50 U				
Bromodichloromethane	ug/L	80	80	ID	0.50 U	0.50 U	0.50 U				
Bromoform	ug/L	80	80	ID	0.50 U	0.50 U	0.50 U				
Bromomethane (Methyl bromide)	ug/L	10	29	35	0.50 U	0.50 U	0.50 U				
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	13000	38000	2200	20 U	20 U	20 U				
Carbon disulfide	ug/L	800	2300	ID	0.50 U	0.50 U	0.50 U				
Carbon tetrachloride	ug/L	5	5	45	0.50 U	0.50 U	0.50 U				
Chlorobenzene	ug/L	100	100	25	0.50 U	0.50 U	0.50 U				
Chloroethane	ug/L	430	1700	1100	0.50 U	0.50 U	0.50 U				
Chloroform (Trichloromethane)	ug/L	80	80	350	0.50 U	0.50 U	0.50 U				
Chloromethane (Methyl chloride)	ug/L	260	1100	ID	0.50 U	0.50 U	0.50 U				
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	0.2	0.2	-	2.0 U	2.0 U	2.0 U				
Dibromochloromethane	ug/L	80	80	ID	0.50 U	0.50 U	0.50 U				
1,2-Dibromoethane (Ethylene dibromide)	ug/L	0.05	0.05	5.7	2.0 U	2.0 U	2.0 U				
1,2-Dichlorobenzene	ug/L	600	600	13	0.50 U	0.50 U	0.50 U				
1,3-Dichlorobenzene	ug/L	6.6	19	28	0.50 U	0.50 U	0.50 U				
1,4-Dichlorobenzene	ug/L	75	75	17	0.50 U	0.50 U	0.50 U				
Dichlorodifluoromethane (CFC-12)	ug/L	1700	4800	ID	0.50 U	0.50 U	0.50 U				
1,1-Dichloroethane	ug/L	880	2500	740	0.50 U	0.50 U	0.50 U				
1,2-Dichloroethane	ug/L	5	5	360	0.50 U	0.50 U	0.50 U				
1,1-Dichloroethene	ug/L	7	7	130	0.50 U	0.50 U	0.50 U				
cis-1,2-Dichloroethene	ug/L	70	70	620	0.50 U	0.50 U	0.50 U				
trans-1,2-Dichloroethene	ug/L	100	100	1500	0.50 U	0.50 U	0.50 U				
1,2-Dichloropropane	ug/L	5	5	230	0.50 U	0.50 U	0.50 U				
cis-1,3-Dichloropropene	ug/L	-	-	-	0.50 U	0.50 U	0.50 U				
trans-1,3-Dichloropropene	ug/L	-	-	-	0.50 U	0.50 U	0.50 U				
Ethylbenzene	ug/L	74	74	18	0.50 U	0.50 U	0.50 U				
2-Hexanone	ug/L	1000	2900	ID	20 U	20 U	20 U				
Isopropyl benzene	ug/L	800	2300	28	2.0 U	2.0 U	2.0 U				
Methyl tert butyl ether (MTBE)	ug/L	40	40	7100	0.50 U	0.50 U	0.50 U				
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	1800	5200	ID	20 U	20 U	20 U				
Methylene chloride	ug/L	5	5	1500	2.0 U	2.0 U	2.0 U				
Styrene	ug/L	100	100	80	0.50 U	0.50 U	0.50 U				
1,1,2,2-Tetrachloroethane	ug/L	8.5	35	78	0.50 U	0.50 U	0.50 U				
Tetrachloroethene	ug/L	5	5	60	0.50 U	0.50 U	0.50 U				
Toluene	ug/L	790	790	270	0.50 U	0.50 U	0.50 U				
1,2,4-Trichlorobenzene	ug/L	70	70	99	2.0 U	2.0 U	2.0 U				
1,1,1-Trichloroethane	ug/L	200	200	89	0.50 U	0.50 U	0.50 U				
1,1,2-Trichloroethane	ug/L	5	5	330	0.50 U	0.50 U	0.50 U				
Trichloroethene	ug/L	5	5	200	0.50 U	0.50 U	0.50 U				
Trichlorofluoromethane (CFC-11)	ug/L	2600	7300	-	0.50 U	0.50 U	0.50 U				
Vinyl chloride	ug/L	2	2	13	0.50 U	0.50 U	0.50 U				
o-Xylene	ug/L	280	280	41	0.50 U	0.50 U	0.50 U				
m&p-Xylenes	ug/L	-	-	-	0.50 U	0.50 U	0.50 U				

TABLE 2

SUMMARY OF OCTOBER 2013 GROUNDWATER ANALYTICAL RESULTS
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Sample Location	<i>Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening</i>			MW-101D	MW-101S	MW-102D	MW-102S
	<i>Levels: Residential and Non-Residential Generic Cleanup Criteria</i> ⁽¹⁾	<i>Residential</i>	<i>Non-Residential</i>				
Sample Identification	<i>Drinking Water</i> ^(a)	<i>Drinking Water</i> ^(b)	<i>Surface Water Interface</i> ^(c)	<i>WG-56393-101613-MR-204</i>	<i>WG-56393-101613-MR-202</i>	<i>WG-56393-101513-MR-196</i>	<i>WG-56393-101513-MR-195</i>
Sample Date				<i>10/16/2013</i>	<i>10/16/2013</i>	<i>10/15/2013</i>	<i>10/15/2013</i>
Sample Elevation (feet AMSL)				<i>664.33-589.33</i>	<i>702.35-663.35</i>	<i>664.43-619.43</i>	<i>701.18-691.18</i>
PCBs	Units						
Aroclor-1016 (PCB-1016)	ug/L	0.5	0.5	0.2	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	ug/L	0.5	0.5	0.2	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	ug/L	0.5	0.5	0.2	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	ug/L	0.5	0.5	0.2	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	ug/L	0.5	0.5	0.2	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	ug/L	0.5	0.5	0.2	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	ug/L	0.5	0.5	0.2	0.020 U	0.020 U	0.020 U
Total PCBs	ug/L	0.5	0.5	200	ND	ND	ND
Metals							
Magnesium	ug/L	400000	1100000	-	25300	26600	24600
Cyanide (amenable)	ug/L	200	200	-	10 U	10 U	10 U
Cyanide (total)	ug/L	200	200	5.2	10 U	10 U	10 U
Mercury	ug/L	2	2	0.0013	0.001 U	0.001 U	0.001 U
Sodium	ug/L	230000	350000	-	26100	26200	21600
Field Parameters							
Conductivity	mS/cm	-	-	-	0.605	0.617	0.614
Dissolved Oxygen (DO)	mg/L	-	-	-	2.71	3.41	4.26
Oxidation Reduction Potential (ORP)	millivolt	-	-	-	73.4	98.7	126.6
pH	s.u.	6.8-8.5	6.5-8.5	-	7.70	7.48	7.40
Temperature	Deg. C	-	-	-	13.16	14.66	14.88
Turbidity	NTU	-	-	-	1.63	1.36	0.96

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

UJ - Not detected; associated reporting limit is estimated.

⁽¹⁾ Cleanup criteria Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels, identified by MDEQ RRD, updated 12/30/2013, pursuant to 1994 PA 451 as amended.

TABLE 2

SUMMARY OF OCTOBER 2013 GROUNDWATER ANALYTICAL RESULTS
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

<i>Sample Location</i>	<i>MW-103D</i>	<i>MW-104D</i>	<i>MW-104S</i>	<i>MW-105D</i>	<i>MW-105S</i>	<i>MW-106D</i>
<i>Sample Identification</i>	<i>WG-56393-101513-MR-197</i>	<i>WG-56393-101513-MR-199</i>	<i>WG-56393-101513-MR-198</i>	<i>WG-56393-101513-MR-200</i>	<i>WG-56393-101513-MR-201</i>	<i>WG-56393-101613-MR-205</i>
<i>Sample Date</i>	10/15/2013	10/15/2013	10/15/2013	10/15/2013	10/15/2013	10/16/2013
<i>Sample Elevation (feet AMSL)</i>	674.37-639.37	633.48-618.48	684.86-658.86	662.79-615.79	699.89-687.89	664.66-620.66
<i>Volatile Organic Compounds (VOCs)</i>	<i>Units</i>					
Acetone	ug/L	20 U				
Benzene	ug/L	0.50 U				
Bromodichloromethane	ug/L	0.50 U				
Bromoform	ug/L	0.50 U				
Bromomethane (Methyl bromide)	ug/L	0.50 U				
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	20 U				
Carbon disulfide	ug/L	0.50 U				
Carbon tetrachloride	ug/L	0.50 U				
Chlorobenzene	ug/L	0.50 U				
Chloroethane	ug/L	0.50 U				
Chloroform (Trichloromethane)	ug/L	0.50 U				
Chloromethane (Methyl chloride)	ug/L	0.50 U				
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	2.0 U				
Dibromochloromethane	ug/L	0.50 U				
1,2-Dibromoethane (Ethylene dibromide)	ug/L	2.0 U				
1,2-Dichlorobenzene	ug/L	0.50 U				
1,3-Dichlorobenzene	ug/L	0.50 U				
1,4-Dichlorobenzene	ug/L	0.50 U				
Dichlorodifluoromethane (CFC-12)	ug/L	0.50 U				
1,1-Dichloroethane	ug/L	0.50 U				
1,2-Dichloroethane	ug/L	0.50 U				
1,1-Dichloroethene	ug/L	0.50 U				
cis-1,2-Dichloroethene	ug/L	0.50 U				
trans-1,2-Dichloroethene	ug/L	0.50 U				
1,2-Dichloropropane	ug/L	0.50 U				
cis-1,3-Dichloropropene	ug/L	0.50 U				
trans-1,3-Dichloropropene	ug/L	0.50 U				
Ethylbenzene	ug/L	0.50 U				
2-Hexanone	ug/L	20 U				
Isopropyl benzene	ug/L	2.0 U				
Methyl tert butyl ether (MTBE)	ug/L	0.50 U				
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	20 U				
Methylene chloride	ug/L	2.0 U				
Styrene	ug/L	0.50 U				
1,1,2,2-Tetrachloroethane	ug/L	0.50 U				
Tetrachloroethene	ug/L	0.50 U				
Toluene	ug/L	0.50 U				
1,2,4-Trichlorobenzene	ug/L	2.0 U				
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U				
Trichloroethene	ug/L	0.50 U				
Trichlorofluoromethane (CFC-11)	ug/L	0.50 U				
Vinyl chloride	ug/L	0.50 U				
o-Xylene	ug/L	0.50 U				
m&p-Xylenes	ug/L	0.50 U				

TABLE 2

SUMMARY OF OCTOBER 2013 GROUNDWATER ANALYTICAL RESULTS
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

	<i>MW-103D</i>	<i>MW-104D</i>	<i>MW-104S</i>	<i>MW-105D</i>	<i>MW-105S</i>	<i>MW-106D</i>
Sample Location						
Sample Identification	<i>WG-56393-101513-MR-197</i>	<i>WG-56393-101513-MR-199</i>	<i>WG-56393-101513-MR-198</i>	<i>WG-56393-101513-MR-200</i>	<i>WG-56393-101513-MR-201</i>	<i>WG-56393-101613-MR-205</i>
Sample Date	<i>10/15/2013</i>	<i>10/15/2013</i>	<i>10/15/2013</i>	<i>10/15/2013</i>	<i>10/15/2013</i>	<i>10/16/2013</i>
Sample Elevation (feet AMSL)	<i>674.37-639.37</i>	<i>633.48-618.48</i>	<i>684.86-658.86</i>	<i>662.79-615.79</i>	<i>699.89-687.89</i>	<i>664.66-620.66</i>
PCBs	Units					
Aroclor-1016 (PCB-1016)	ug/L	0.020 U	0.020 U	0.020 U	0.021 U	0.020 U
Aroclor-1221 (PCB-1221)	ug/L	0.040 U	0.040 U	0.040 U	0.042 U	0.040 U
Aroclor-1232 (PCB-1232)	ug/L	0.020 U	0.020 U	0.020 U	0.021 U	0.020 U
Aroclor-1242 (PCB-1242)	ug/L	0.020 U	0.020 U	0.020 U	0.021 U	0.020 U
Aroclor-1248 (PCB-1248)	ug/L	0.020 U	0.020 U	0.020 U	0.021 U	0.020 U
Aroclor-1254 (PCB-1254)	ug/L	0.020 U	0.020 U	0.020 U	0.021 U	0.020 U
Aroclor-1260 (PCB-1260)	ug/L	0.020 U	0.020 U	0.020 U	0.021 U	0.020 U
Total PCBs	ug/L	ND	ND	ND	ND	ND
Metals						
Magnesium	ug/L	23800	24600	24700	25900	30000
Cyanide (amenable)	ug/L	10 U				
Cyanide (total)	ug/L	10 U				
Mercury	ug/L	0.001 U				
Sodium	ug/L	20800	22400	22600	22900	25100
Field Parameters						
Conductivity	mS/cm	0.525	0.558	0.629	0.576	0.658
Dissolved Oxygen (DO)	mg/L	0.27	1.53	1.84	1.24	0.40
Oxidation Reduction Potential (ORP)	millivolt	44.3	83.8	76.4	75.6	49.8
pH	s.u.	7.48	7.49	7.39	7.39	7.10
Temperature	Deg. C	14.49	14.07	14.40	13.17	15.17
Turbidity	NTU	1.76	1.10	1.60	0.76	1.48

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

UJ - Not detected; associated reporting limit is estimated.

(1) Cleanup criteria Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels, identified by MDEQ RRD, updated 12/30/2013, pursuant to 1994 PA 451 as amended.

TABLE 2

SUMMARY OF OCTOBER 2013 GROUNDWATER ANALYTICAL RESULTS
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

<i>Sample Location</i>	<i>MW-106S</i>	<i>MW-107S</i>	<i>MW-108D</i>	<i>MW-108D</i>	<i>MW-108S</i>	<i>MW-109D</i>
<i>Sample Identification</i>	<i>WG-56393-101613-MR-206</i>	<i>WG-56393-101413-MR-190</i>	<i>WG-56393-101413-MR-192</i>	<i>WG-56393-101413-MR-193</i>	<i>WG-56393-101413-MR-191</i>	<i>WG-56393-101413-MR-194</i>
<i>Sample Date</i>	<i>10/16/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i> <i>Duplicate</i>	<i>10/14/2013</i>	<i>10/14/2013</i>
<i>Sample Elevation (feet AMSL)</i>	<i>701.89-692.89</i>	<i>695.76-682.76</i>	<i>663.39-618.39</i>	<i>663.39-618.39</i>	<i>701.32-692.32</i>	<i>689.41-666.41</i>
<i>Volatile Organic Compounds (VOCs)</i>	<i>Units</i>					
Acetone	ug/L	20 U	20 U	20 U	20 U	20 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	20 U	20 U	20 U	20 U	20 U
Carbon disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.14 J	0.12 J	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.12 J	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	20 U	20 U	20 U	20 U	20 U
Isopropyl benzene	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	20 U	20 U	20 U	20 U	20 U
Methylene chloride	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.11 J	0.11 J	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m&p-Xylenes	ug/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

TABLE 2

SUMMARY OF OCTOBER 2013 GROUNDWATER ANALYTICAL RESULTS
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

<i>Sample Location</i>	<i>MW-106S</i>	<i>MW-107S</i>	<i>MW-108D</i>	<i>MW-108D</i>	<i>MW-108S</i>	<i>MW-109D</i>
<i>Sample Identification</i>	<i>WG-56393-101613-MR-206</i>	<i>WG-56393-101413-MR-190</i>	<i>WG-56393-101413-MR-192</i>	<i>WG-56393-101413-MR-193</i>	<i>WG-56393-101413-MR-191</i>	<i>WG-56393-101413-MR-194</i>
<i>Sample Date</i>	<i>10/16/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>
<i>Sample Elevation (feet AMSL)</i>	<i>701.89-692.89</i>	<i>695.76-682.76</i>	<i>663.39-618.39</i>	<i>663.39-618.39</i>	<i>701.32-692.32</i>	<i>689.41-666.41</i>
<i>PCBs</i>	<i>Units</i>					
Aroclor-1016 (PCB-1016)	ug/L	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U
Aroclor-1221 (PCB-1221)	ug/L	0.040 U	0.040 U	0.040 U	0.040 U	0.041 U
Aroclor-1232 (PCB-1232)	ug/L	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U
Aroclor-1242 (PCB-1242)	ug/L	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U
Aroclor-1248 (PCB-1248)	ug/L	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U
Aroclor-1254 (PCB-1254)	ug/L	0.0051 J	0.020 U	0.020 U	0.020 U	0.021 U
Aroclor-1260 (PCB-1260)	ug/L	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U
Total PCBs	ug/L	0.0051 J	ND	ND	ND	ND
<i>Metals</i>						
Magnesium	ug/L	29500	29200	27500	27000	26900
Cyanide (amenable)	ug/L	10 U				
Cyanide (total)	ug/L	10 U				
Mercury	ug/L	0.00495 ^c	0.001 U	0.001 U	0.001 U	0.001 U
Sodium	ug/L	23700	24100	26800	26200	24600
<i>Field Parameters</i>						
Conductivity	mS/cm	0.605	0.707	0.676	0.630	0.650
Dissolved Oxygen (DO)	mg/L	2.71	0.02	0.25	1.26	1.32
Oxidation Reduction Potential (ORP)	millivolt	73.4	-45.9	-17.4	10.9	24.5
pH	s.u.	7.70	6.95	7.26	7.23	7.22
Temperature	Deg. C	13.16	14.29	13.67	14.73	13.74
Turbidity	NTU	1.65	1.98	1.76	1.07	0.79

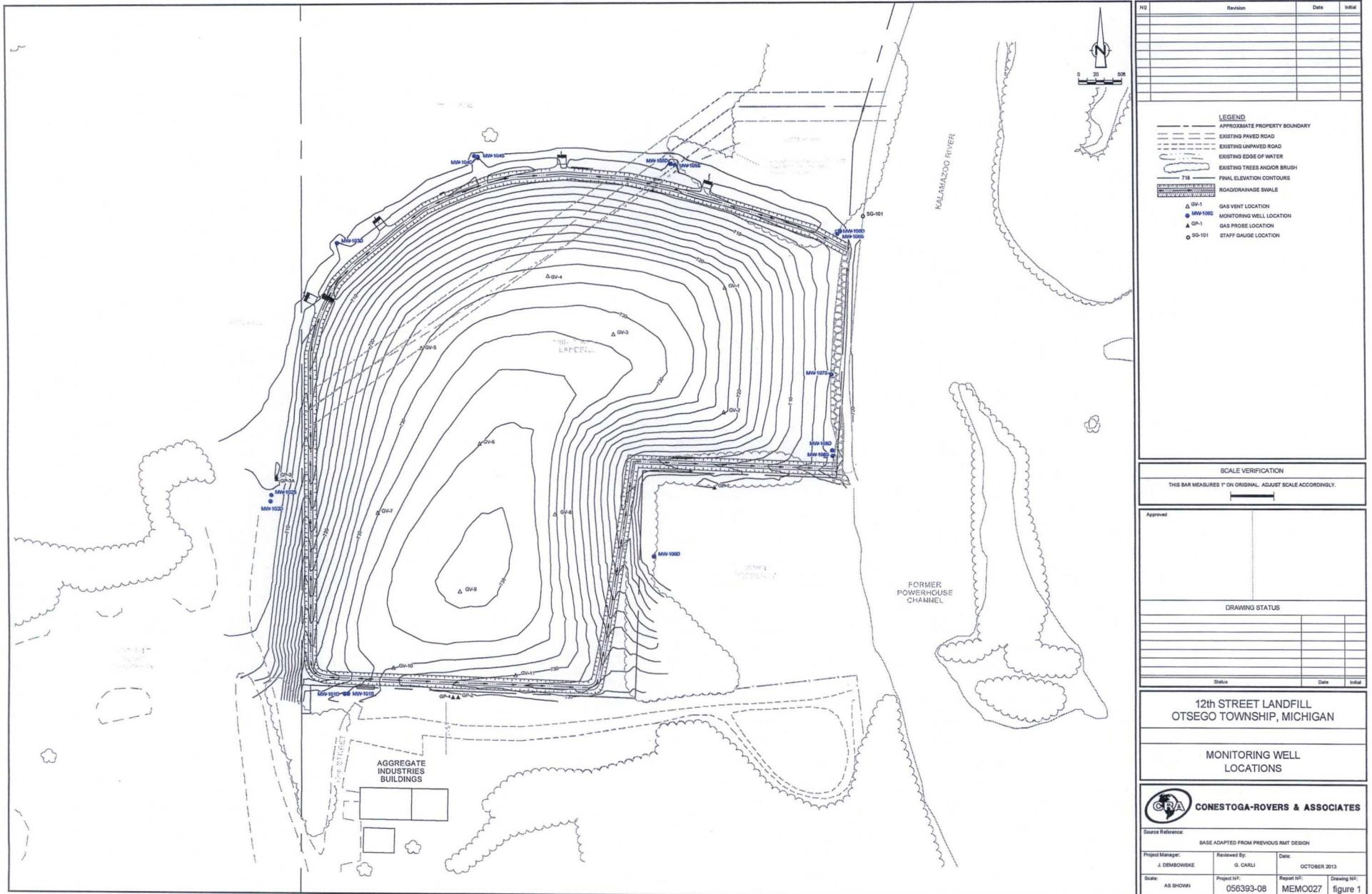
Notes:

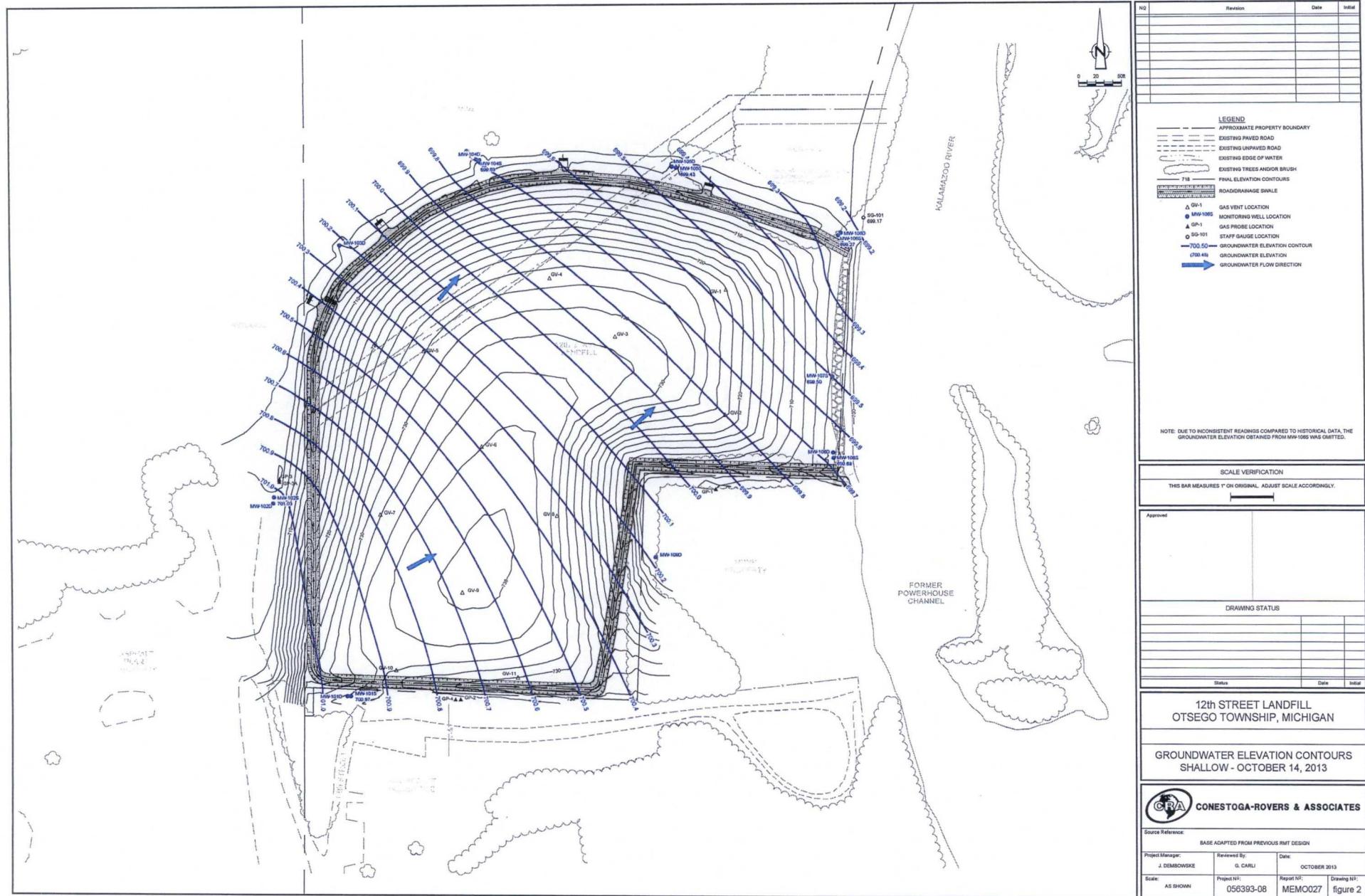
U - Not detected at the associated reporting limit.

J - Estimated concentration.

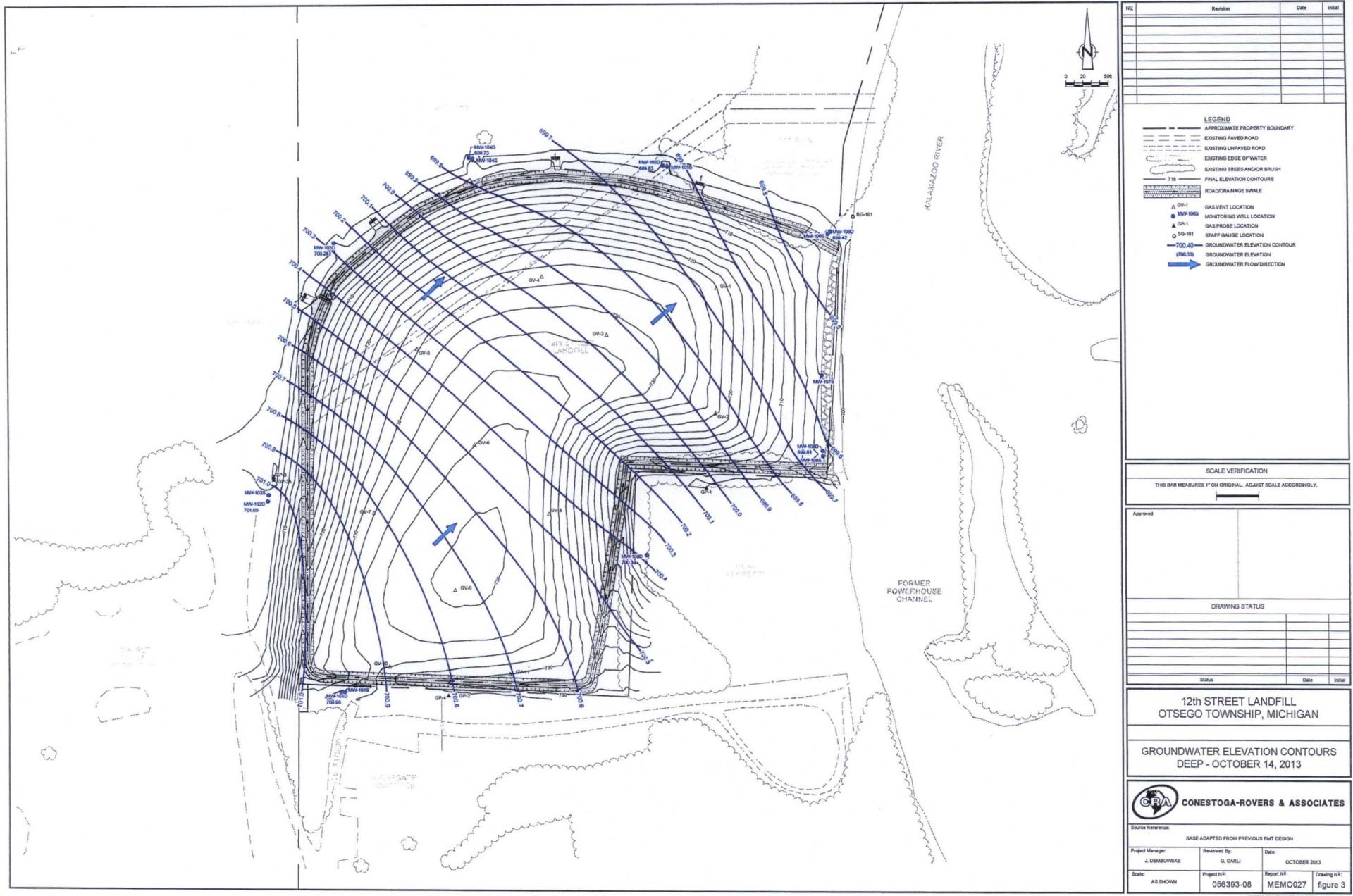
UJ - Not detected; associated reporting limit is estimated.

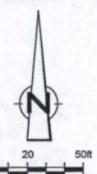
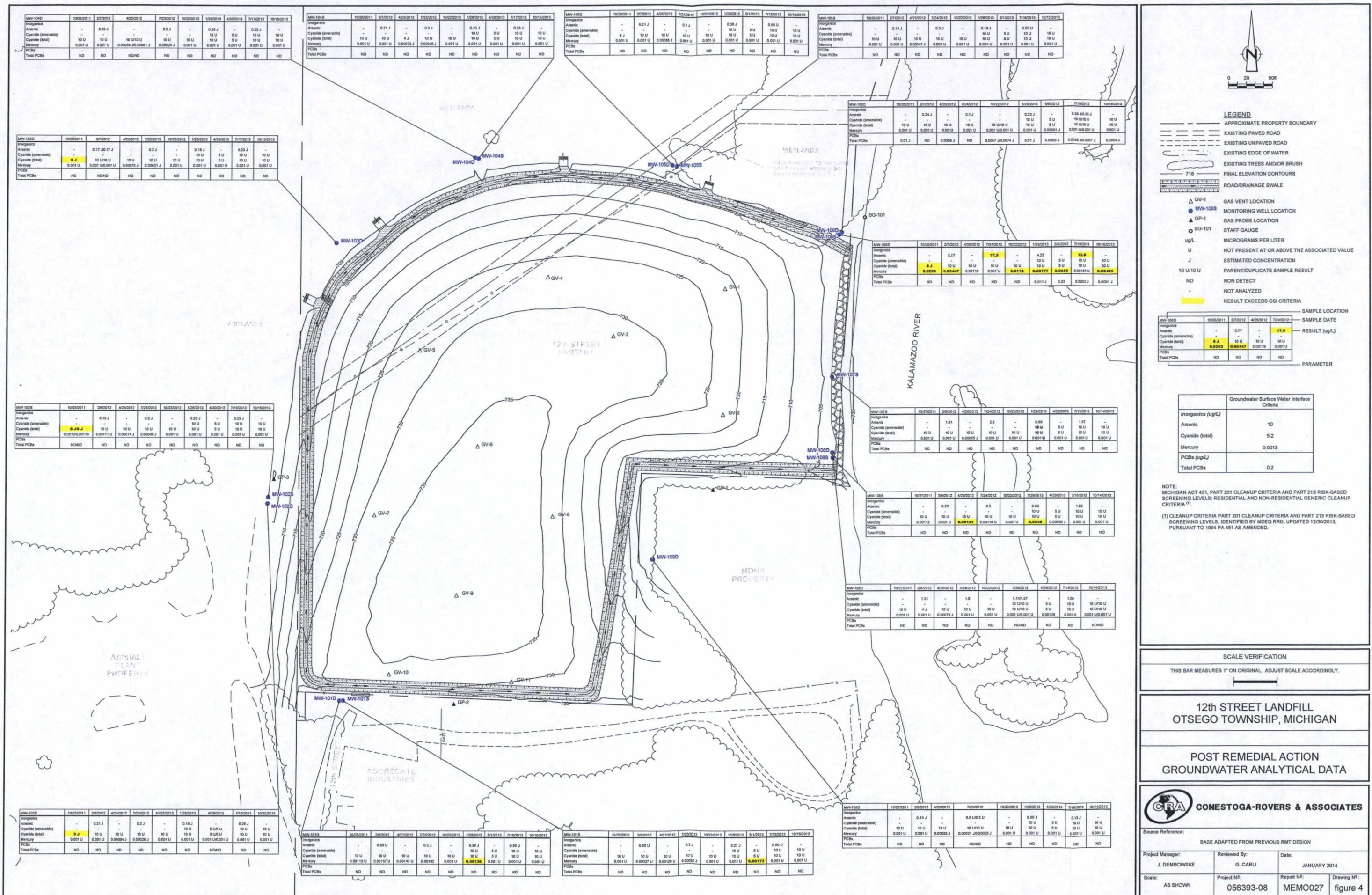
⁽¹⁾ Cleanup criteria Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels, identified by MDEQ RRD, updated 12/30/2013, pursuant to 1994 PA 451 as amended.





056383-06(MEMO027)GN-SC002 NOV 6/2013





LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- - EXISTING PAVED ROAD
- - - EXISTING UNPAVED ROAD
- - - - EXISTING EDGE OF WATER
- - - - - EXISTING TREES AND/OR BRUSH
- 718 FINAL ELEVATION CONTOURS
- ROAD/DRAINAGE SWALE

- △ GV-1 GAS VENT LOCATION
 - MW-108S MONITORING WELL LOCATION
 - ▲ GP-1 GAS PROBE LOCATION
 - SG-101 STAFF GAUGE
- ug/L MICROGRAMS PER LITER
- U NOT PRESENT AT OR ABOVE THE ASSOCIATED VALUE
- J ESTIMATED CONCENTRATION
- 10 U/10 PARENT/DUPLICATE SAMPLE RESULT
- ND NON DETECT
- NOT ANALYZED
- RESULT EXCEEDS GSI CRITERIA

MW-108S	10/26/2011	2/7/2012	4/26/2012	7/24/2012	10/22/2012	1/29/2013	5/9/2013	7/19/2013	10/16/2013
Inorganics	-	-	-	-	-	-	-	-	-
Arsenic	-	-	-	-	-	-	-	-	-
Cyanide (amenable)	8 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyanide (total)	0.001 U	0.001 U	0.0007 J	0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Mercury	-	-	-	-	-	-	-	-	-
PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND

SAMPLE LOCATION

MW-108S 10/26/2011 2/7/2012 4/26/2012 7/24/2012 SAMPLE DATE

RESULT (ug/L)

17.8

0.0203 0.00447 0.001 U 0.001 U 0.001 U 0.001 U 0.001 U 0.001 U 0.001 U

PCBs Total PCBs ND ND ND ND ND ND ND ND ND ND

PARAMETER

Inorganics (ug/L)

Arsenic 10

Cyanide (total) 5.2

Mercury 0.0013

PCBs (ug/L)

Total PCBs 0.2

NOTE:
MICHIGAN ACT 451, PART 201 CLEANUP CRITERIA AND PART 213 RISK-BASED SCREENING LEVELS: RESIDENTIAL AND NON-RESIDENTIAL GENERIC CLEANUP CRITERIA⁽¹⁾.

(1) CLEANUP CRITERIA PART 201 CLEANUP CRITERIA AND PART 213 RISK-BASED SCREENING LEVELS, IDENTIFIED BY MDEQ RRD, UPDATED 12/30/2013, PURSUANT TO 1994 PA 451 AS AMENDED.

SCALES VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

12TH STREET LANDFILL OTSEGO TOWNSHIP, MICHIGAN

POST REMEDIAL ACTION GROUNDWATER ANALYTICAL DATA

CRA CONESTOGA-ROVERS & ASSOCIATES

Source Reference: BASE ADAPTED FROM PREVIOUS RMT DESIGN

Project Manager: J. DEMBOWSKI Reviewed By: G. CARLI Date: JANUARY 2014

Scale: AS SHOWN Project No.: 056393-08 Report No.: MEMO027 Drawing No.: figure 4

056393-08(MEMO027)GN-5C004 JAN 8/2014

**MEMORANDUM 26
ANALYTICAL RESULTS AND FULL VALIDATION
GROUNDWATER MONITORING
12TH STREET LANDFILL**



**CONESTOGA-ROVERS
& ASSOCIATES**

2055 Niagara Falls Blvd., Suite #3
Niagara Falls, New York 14304
Telephone: (716) 297-6150 Fax: (716) 297-2265
www.CRAworld.com

MEMORANDUM

To: Greg Carli, Jodie Dembowske REF. No.: 056393

FROM: Susan Scrocchi/adh/26 DATE: December 18, 2013

RE: Analytical Results and Full Validation
Groundwater Monitoring
12th Street Landfill
Otsego Township, Michigan
October 2013

1.0 Introduction

The following document details a validation of analytical results for groundwater samples collected at the 12th Street Landfill Site in Otsego Township, Michigan during October 2013. Samples were submitted to ALS Environmental Laboratory, located in Kelso, Washington. A sample collection and analysis summary is presented in Table 1. The validated analytical results are summarized in Table 2. A summary of the analytical methodology is presented in Table 3.

Full Contract Laboratory Program (CLP) equivalent raw data deliverables were provided by the laboratory. Evaluation of the data was based on information obtained from the finished data sheets, raw data, chain of custody forms, calibration data, blank data, duplicates, recovery data from surrogate spikes, laboratory control samples (LCS), matrix spike (MS) samples, and field quality assurance/quality control (QA/QC) samples. The assessment of analytical and in-house data included checks for: data consistency (by observing comparability of duplicate analyses), adherence to accuracy and precision criteria, and transmittal errors.

The QA/QC criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and applicable guidance from the documents entitled:

- i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", United States Environmental Protection Agency (USEPA) 540/R-99-008, October 1999 and June 2008
- ii) "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", USEPA 540/R-94-013, February 1994

Items i) and ii) will subsequently be referred to as the "Guidelines" in this Memorandum.

of the calibration curve is acceptable if all RSD values are less than or equal to 20.0 percent or if the correlation coefficient (R) is 0.995 or greater for linear regression curves.

Retention time windows are also calculated from the initial calibration analyses. These windows are then used to identify all compounds of interest in subsequent analyses.

All initial calibration standards were analyzed at the required frequencies. All retention time, peak resolution, and linearity criteria were satisfied as specified in the method.

5.0 Initial Calibration – Inorganic Analyses

Initial calibration of the instruments ensures that they are capable of producing satisfactory quantitative data at the beginning of a series of analyses. For Inductively Coupled Plasma (ICP) analysis, a calibration blank and at least one standard must be analyzed at each wavelength to establish the analytical curve. For instrumental general chemistry analyses, a calibration blank and a minimum of five standards must be analyzed to establish the analytical curve, and resulting correlation coefficients (R) must be 0.995 or greater.

After the analyses of the calibration curves, an initial calibration verification (ICV) standard must be analyzed to verify the analytical accuracy of the calibration curves. All analyte recoveries from the analyses of the ICVs must be within the following control limits:

<i>Analytical Method</i>	<i>Parameter</i>	<i>Control Limits</i>
ICP	Metals	90 - 110 percent
Instrumental Wet Chemistry	Cyanide	85 - 115 percent

For low level mercury analyses, three blanks and a minimum of five standards are analyzed. The average blank response is used to correct each standard response, and the corrected responses are used to calculate calibration factors. The calibration is acceptable if the RSD of the calibration factors is less than 15 percent and if recovery of the lowest standard is 75 to 125 percent.

Upon review of the data, it was determined that the calibration curves and ICVs were analyzed at the proper frequencies and that all of the above-specified criteria were met. The laboratory effectively demonstrated that the instrumentation used for metals and general chemistry analyses were properly calibrated prior to sample analysis.

6.0 Continuing Calibration - Organic Analyses

GC/MS

To ensure that instrument calibration for VOC analyses is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

- i) All RRF values must be greater than or equal to 0.05 (0.01 for poor responders)
- ii) Percent difference (%D) values must not exceed 25 percent (40.0 percent for poor responders)

Calibration standards were analyzed at the required frequency, and the results met the above criteria for instrument sensitivity. Bromomethane and carbon tetrachloride exhibited variability between initial and continuing standards. The associated sample results were qualified as estimated (see Table 4).

GC

To ensure that the calibration of the instrument for organic analyses by GC is valid throughout the sample analysis period, continuing calibration standards are analyzed and evaluated on a regular basis. To evaluate the continued linearity of the calibration, %D values are calculated for each compound. As specified in the methods, all %D values should not exceed 15 percent. To ensure that compound retention times do not vary over the analysis period, all retention times for continuing calibration compounds must fall within the established retention time windows.

All continuing calibration standards were analyzed at the required frequency. All %D values and compound retention times met the above criteria, indicating acceptable instrument calibration throughout the analysis period.

7.0 Continuing Calibration - Inorganic Analyses

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration verification (CCV) standards are analyzed on a regular basis. Each CCV is deemed acceptable if all analyte recoveries are within the control limits specified above for the ICVs. If some of the CCV analyte recoveries are outside the control limits, samples analyzed before and after the CCV, up until the previous and proceeding CCV analyses, are affected.

For this study, CCVs were analyzed at the proper frequency. All analyte recoveries reported for the CCVs were within the specified limits.

8.0 Contract Required Detection Limit (CRDL) Standard Analyses

To verify the linearity of the ICP calibration near the detection limit, a standard is analyzed which contains the ICP analytes at specified concentrations. This standard must be analyzed at the beginning and end of each sample analysis run or a minimum of twice per 8-hour period.

CRDL recoveries were evaluated using the criteria specified in the October 2004 "Guidelines". The CRDL recoveries were acceptable.

9.0 Laboratory Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures. Additionally, initial and continuing calibration blanks (ICBs/CCBs) are routinely analyzed after each ICV/CCV for the inorganic parameters.

For this study, laboratory method blanks were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

Organic Analyses

Low level concentrations of common laboratory artifacts were detected in the method blanks. All associated sample results with similar concentrations were qualified as non-detect (see Table 5).

Inorganic Analyses

Upon review of the ICBs, CCBs, and method blanks, it was noted that metal concentrations were observed above the method detection limit (MDL). All investigative samples associated with the low level detections reported either non-detect concentrations or concentrations significantly greater than the associated laboratory blank concentrations for the analytes of interest. These sample results were not impacted by the contamination detected. No qualification of the data was necessary.

10.0 Surrogate Spike Recoveries

In accordance with the methods employed, all samples, blanks, and QC samples analyzed for organics are spiked with surrogate compounds prior to sample extraction and/or analysis. Surrogate recoveries provide a means to evaluate the effects of laboratory performance on individual sample matrices.

All samples submitted for VOC and PCB determinations were spiked with the appropriate number of surrogate compounds prior to sample extraction and/or analysis.

Surrogate recoveries were assessed against laboratory control limits. All surrogate recoveries met the above criteria.

11.0 Internal Standards (IS) Analyses

IS data were evaluated for all VOC sample analyses.

Organics Analyses

To ensure that changes in the GC/MS sensitivity and response do not affect sample analysis results, IS compounds are added to each sample prior to analysis. All results are then calculated as a ratio of the IS responses.

The sample IS results were evaluated against the following criteria:

- i) The retention time of the IS must not vary more than ± 30 seconds from the associated calibration standard
- ii) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard

All organic IS recoveries and retention times met the above criteria.

12.0 Laboratory Control Sample Analyses

LCS are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects.

For this study, LCS were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

Organic Analyses

The LCS contained all compounds of interest. All LCS recoveries were within the laboratory control limits, demonstrating acceptable analytical accuracy.

Inorganic Analyses

The LCS contained all analytes of interest. LCS recoveries were assessed per the "Guidelines". All LCS recoveries were within the control limits, demonstrating acceptable analytical accuracy.

13.0 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses - Organic Analyses

To evaluate the effects of sample matrices on the extraction or digestion process, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS/MSD samples. The relative percent difference (RPD) between the MS and MSD is used to assess analytical precision. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed.

MS/MSD analyses were performed as specified in Table 1.

Organic Analyses

The MS/MSD samples were spiked with all compounds of interest. All percent recoveries and RPD values were within the laboratory control limits, demonstrating acceptable analytical accuracy and precision.

14.0 Matrix Spike Analyses – Inorganic Analyses

To evaluate the effects of sample matrices on the preparation, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS samples. For this study, MS samples were prepared and analyzed by the laboratory as specified in Table 1. The laboratory performed additional site-specific MS analyses internally.

The MS results were evaluated per the "Guidelines". In accordance with the "Guidelines", MS recoveries for samples with analyte concentrations significantly greater than the spike concentrations could not be assessed.

All MS analyses performed were acceptable, demonstrating acceptable analytical accuracy.

15.0 Duplicate Sample Analyses – Inorganic Analyses

Analytical precision is evaluated based on the analysis of laboratory duplicate samples. For this study, duplicate samples were prepared and analyzed by the laboratory as specified in Table 1. The laboratory performed additional site-specific duplicate analyses internally. The duplicate results were evaluated per the "Guidelines".

All duplicate analyses performed were acceptable, demonstrating acceptable analytical precision.

16.0 ICP Serial Dilution

The serial dilution determines whether significant physical or chemical interferences exist due to sample matrix. A minimum of 1 per 20 investigative samples or at least 1 per analytical batch must be analyzed at a five-fold dilution. For samples with sufficient analyte concentrations (>50 times the method detection limit), the serial dilution results must agree within 10 percent of the original results.

A serial dilution was performed on each MS sample. All results met the criteria above.

17.0 ICP Interference Check Sample Analysis (ICS)

To verify that the laboratory has established proper inter-element and background correction factors, ICSs are analyzed. These samples contain high concentrations of aluminum, calcium, magnesium, and iron and are analyzed at the beginning and end of each sample analysis period. The ICSs are evaluated against recovery control limits of 80 to 120 percent.

ICS analysis results were evaluated for all samples using the criteria in the "Guidelines". All ICS recoveries and results were acceptable.

18.0 Field QA/QC Samples

The field QA/QC consisted of one trip blank sample, one rinse blank sample, and one field duplicate sample set.

Trip Blank Sample Analysis

To evaluate contamination from sample collection, transportation, storage, and analytical activities, one trip blank was submitted to the laboratory for VOC and mercury analysis. All VOC results were non-detect with the exception of carbon disulfide and chloroform present at low concentrations. Associated samples were previously qualified as non-detect due to method blank contamination. Mercury was detected in the trip blank. All associated samples with similar concentrations were qualified as non-detect (see Table 6).

Rinse Blank Sample Analysis

To assess field decontamination procedures, ambient conditions at the Site, and cleanliness of sample containers, one rinse blank was submitted for analysis, as identified in Table 1. All results were non-detect for the analytes of interest with the exception of low metal concentrations. All associated sample results were significantly greater than the blank results and would not have been impacted.

Field Duplicate Sample Analysis

To assess the analytical and sampling protocol precision, one field duplicate sample was collected and submitted "blind" to the laboratory, as specified in Table 1. The RPDs associated with these duplicate samples must be less than 50 and 100 percent for water and soil samples, respectively. If the reported concentration in either the investigative

sample or its duplicate is less than five times the practical quantitation limit (PQL), the evaluation criteria is one or two times the PQL value for water and soil samples, respectively.

All field duplicate results were within acceptable agreement, demonstrating acceptable sampling and analytical precision.

19.0 Analyte Reporting

The laboratory reported detected results down to the laboratory's MDL for each analyte. Positive analyte detections less than the PQL but greater than the MDL were qualified as estimated (J) in Table 2 unless qualified otherwise in this memorandum. Non-detect results were presented as non-detect at the PQL in Table 2.

20.0 Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to the identification criteria established by the methods. The organic compounds reported adhered to the specified identification criteria.

21.0 Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 1 are acceptable with the specific qualifications noted herein.

TABLE 1

**SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

<i>Sample Identification</i>	<i>Location</i>	<i>Matrix</i>	<i>Collection Date (mm/dd/yyyy)</i>	<i>Collection Time (hr:min)</i>	<i>Analysis/Parameters</i>					<i>Comments</i>
					<i>Cyanide (total and amenable)</i>	<i>VOCs</i>	<i>PCBs</i>	<i>Metals</i>	<i>Mercury</i>	
EB-56393-101613-MR-203	-	-	10/16/2013	14:40	X	X	X	X	X	Equipment Blank
TB-56393-101613-MR-207	-	-	10/16/2013	23:59		X			X	Trip Blank
WG-56393-101413-MR-190	MW-107S	Groundwater	10/14/2013	12:25	X	X	X	X	X	
WG-56393-101413-MR-191	MW-108S	Groundwater	10/14/2013	14:25	X	X	X	X	X	MS/MSD
WG-56393-101413-MR-192	MW-108D	Groundwater	10/14/2013	13:07	X	X	X	X	X	
WG-56393-101413-MR-193	MW-108D	Groundwater	10/14/2013	13:17	X	X	X	X	X	
WG-56393-101413-MR-194	MW-109D	Groundwater	10/14/2013	15:30	X	X	X	X	X	
WG-56393-101513-MR-195	MW-102S	Groundwater	10/15/2013	11:00	X	X	X	X	X	
WG-56393-101513-MR-196	MW-102D	Groundwater	10/15/2013	10:15	X	X	X	X	X	
WG-56393-101513-MR-197	MW-103D	Groundwater	10/15/2013	13:05	X	X	X	X	X	
WG-56393-101513-MR-198	MW-104S	Groundwater	10/15/2013	13:20	X	X	X	X	X	
WG-56393-101513-MR-199	MW-104D	Groundwater	10/15/2013	14:23	X	X	X	X	X	
WG-56393-101513-MR-200	MW-105D	Groundwater	10/15/2013	16:00	X	X	X	X	X	
WG-56393-101513-MR-201	MW-105S	Groundwater	10/15/2013	16:38	X	X	X	X	X	
WG-56393-101613-MR-202	MW-101S	Groundwater	10/16/2013	12:20	X	X	X	X	X	
WG-56393-101613-MR-204	MW-101D	Groundwater	10/16/2013	14:06	X	X	X	X	X	
WG-56393-101613-MR-205	MW-106D	Groundwater	10/16/2013	16:56	X	X	X	X	X	
WG-56393-101613-MR-206	MW-106S	Groundwater	10/16/2013	16:11	X	X	X	X	X	

Notes:

MS/MSD - Matrix spike/matrix spike duplicate.

TABLE 2

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

Sample Location:	MW-101D	MW-101S	MW-102D	MW-102S	MW-103D	MW-104D
Sample Identification:	WG-56393-101613-MR-204	WG-56393-101613-MR-202	WG-56393-101513-MR-196	WG-56393-101513-MR-195	WG-56393-101513-MR-197	WG-56393-101513-MR-199
Sample Date:	10/16/2013	10/16/2013	10/15/2013	10/15/2013	10/15/2013	10/15/2013
Sample Type:						
Screen Depth:	Screen Depth: (70-75)	Screen Depth: (32-29)	Screen Depth: (40-45)	Screen Depth: (3-10)	Screen Depth: (30-35)	Screen Depth: (40-45)
Sample Elevation (feet AMSL):	664.33-589.33	702.35-663.35	664.43-619.43	701.18-691.18	674.37-639.37	633.48-618.48
Units						
Volatile Organic Compounds (VOCs)						
Acetone	µg/L	20 U				
Benzene	µg/L	0.50 U				
Bromodichloromethane	µg/L	0.50 U				
Bromoform	µg/L	0.50 U				
Bromomethane (Methyl bromide)	µg/L	0.50 U				
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	20 U				
Carbon disulfide	µg/L	0.50 U				
Carbon tetrachloride	µg/L	0.50 U				
Chlorobenzene	µg/L	0.50 U				
Chloroethane	µg/L	0.50 U				
Chloroform (Trichloromethane)	µg/L	0.50 U				
Chloromethane (Methyl chloride)	µg/L	0.50 U				
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U				
Dibromochloromethane	µg/L	0.50 U				
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U				
1,2-Dichlorobenzene	µg/L	0.50 U				
1,3-Dichlorobenzene	µg/L	0.50 U				
1,4-Dichlorobenzene	µg/L	0.50 U				
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 U				
1,1-Dichloroethane	µg/L	0.50 U				
1,2-Dichloroethane	µg/L	0.50 U				
1,1-Dichloroethene	µg/L	0.50 U				
cis-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.080 J	0.50 U	0.50 U
trans-1,2-Dichloroethene	µg/L	0.50 U				
1,2-Dichloropropane	µg/L	0.50 U				
cis-1,3-Dichloropropene	µg/L	0.50 U				
trans-1,3-Dichloropropene	µg/L	0.50 U				
Ethylbenzene	µg/L	0.50 U				
2-Hexanone	µg/L	20 U				
Isopropyl benzene	µg/L	2.0 U				
Methyl tert butyl ether (MTBE)	µg/L	0.50 U				
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	20 U				
Methylene chloride	µg/L	2.0 U				
Styrene	µg/L	0.50 U				
1,1,2,2-Tetrachloroethane	µg/L	0.50 U				
Tetrachloroethene	µg/L	0.50 U				
Toluene	µg/L	0.50 U				
1,2,4-Trichlorobenzene	µg/L	2.0 U				
1,1,1-Trichloroethane	µg/L	0.50 U				
1,1,2-Trichloroethane	µg/L	0.50 U				
Trichloroethene	µg/L	0.50 U				
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U				
Vinyl chloride	µg/L	0.50 U				
o-Xylene	µg/L	0.50 U				
m&p-Xylenes	µg/L	0.50 U				

TABLE 2

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

<i>Sample Location:</i>	<i>MW-101D</i>	<i>MW-101S</i>	<i>MW-102D</i>	<i>MW-102S</i>	<i>MW-103D</i>	<i>MW-104D</i>
<i>Sample Identification:</i>	WG-56393-101613-MR-204	WG-56393-101613-MR-202	WG-56393-101513-MR-196	WG-56393-101513-MR-195	WG-56393-101513-MR-197	WG-56393-101513-MR-199
<i>Sample Date:</i>	10/16/2013	10/16/2013	10/15/2013	10/15/2013	10/15/2013	10/15/2013
<i>Sample Type:</i>						
<i>Screen Depth:</i>	<i>Screen Depth: (70-75)</i> 664.33-589.33	<i>Screen Depth: (32-29)</i> 702.35-663.35	<i>Screen Depth: (40-45)</i> 664.43-619.43	<i>Screen Depth: (3-10)</i> 701.18-691.18	<i>Screen Depth: (30-35)</i> 674.37-639.37	<i>Screen Depth: (40-45)</i> 633.48-618.48
<i>Sample Elevation (feet AMSL):</i>						
<i>PCBs</i>	<i>Units</i>					
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	ND	ND	ND	ND
<i>Metals</i>	<i>Units</i>					
Magnesium	µg/L	25300	26600	24600	26500	23800
Cyanide (amenable)	µg/L	10 U	10 U	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U	10 U	10 U
Mercury	µg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sodium	µg/L	26100	26200	21600	20700	20800

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

UJ - Not detected; associated reporting limit is estimated.

ND - Not detected at the associated reporting limit.

AMSL - Above mean sea level.

TABLE 2

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

Sample Location:	MW-104S	MW-105D	MW-105S	MW-106D	MW-106S	MW-107S
Sample Identification:	WG-56393-101513-MR-198	WG-56393-101513-MR-200	WG-56393-101513-MR-201	WG-56393-101613-MR-205	WG-56393-101613-MR-206	WG-56393-101413-MR-190
Sample Date:	10/15/2013	10/15/2013	10/15/2013	10/16/2013	10/16/2013	10/14/2013
Sample Type:						
Screen Depth:	Screen Depth: (20-25)	Screen Depth: (42-47)	Screen Depth: (5-12)	Screen Depth: (40-45)	Screen Depth: (2-9)	Screen Depth: (8-13)
Sample Elevation (feet AMSL):	684.86-658.86	662.79-615.79	699.89-687.89	664.66-620.66	701.89-692.89	695.76-682.76
Units						
Volatile Organic Compounds (VOCs)						
Acetone	µg/L	20 U				
Benzene	µg/L	0.50 U				
Bromodichloromethane	µg/L	0.50 U				
Bromoform	µg/L	0.50 U				
Bromomethane (Methyl bromide)	µg/L	0.50 U				
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	20 U				
Carbon disulfide	µg/L	0.50 U				
Carbon tetrachloride	µg/L	0.50 U				
Chlorobenzene	µg/L	0.50 U				
Chloroethane	µg/L	0.50 U				
Chloroform (Trichloromethane)	µg/L	0.50 U				
Chloromethane (Methyl chloride)	µg/L	0.50 U				
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U				
Dibromochloromethane	µg/L	0.50 U				
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U				
1,2-Dichlorobenzene	µg/L	0.50 U				
1,3-Dichlorobenzene	µg/L	0.50 U				
1,4-Dichlorobenzene	µg/L	0.50 U				
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 U				
1,1-Dichloroethane	µg/L	0.50 U				
1,2-Dichloroethane	µg/L	0.50 U				
1,1-Dichloroethene	µg/L	0.50 U				
cis-1,2-Dichloroethene	µg/L	0.50 U				
trans-1,2-Dichloroethene	µg/L	0.50 U				
1,2-Dichloropropane	µg/L	0.50 U				
cis-1,3-Dichloropropene	µg/L	0.50 U				
trans-1,3-Dichloropropene	µg/L	0.50 U				
Ethybenzene	µg/L	0.50 U				
2-Hexanone	µg/L	20 U				
Isopropyl benzene	µg/L	2.0 U				
Methyl tert butyl ether (MTBE)	µg/L	0.50 U				
4-Methyl-2-pentanone (Methyl Isobutyl ketone) (MIBK)	µg/L	20 U				
Methylene chloride	µg/L	2.0 U				
Styrene	µg/L	0.50 U				
1,1,2,2-Tetrachloroethane	µg/L	0.50 U				
Tetrachloroethene	µg/L	0.50 U				
Toluene	µg/L	0.50 U				
1,2,4-Trichlorobenzene	µg/L	2.0 U				
1,1,1-Trichloroethane	µg/L	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U
1,1,2-Trichloroethane	µg/L	0.50 U				
Trichloroethene	µg/L	0.50 U				
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U				
Vinyl chloride	µg/L	0.50 U				
o-Xylene	µg/L	0.50 U				
m&p-Xylenes	µg/L	0.50 U				

TABLE 2

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

Sample Location:	MW-104S	MW-105D	MW-105S	MW-106D	MW-106S	MW-107S
Sample Identification:	WG-56393-101513-MR-198	WG-56393-101513-MR-200	WG-56393-101513-MR-201	WG-56393-101613-MR-205	WG-56393-101613-MR-206	WG-56393-101413-MR-190
Sample Date:	10/15/2013	10/15/2013	10/15/2013	10/16/2013	10/16/2013	10/14/2013
Sample Type:						
Screen Depth:	Screen Depth: (20-25)	Screen Depth: (42-47)	Screen Depth: (5-12)	Screen Depth: (40-45)	Screen Depth: (2-9)	Screen Depth: (8-13)
Sample Elevation (feet AMSL):	684.86-658.86	662.79-615.79	699.89-687.89	664.66-620.66	701.89-692.89	695.76-682.76
Units						
PCBs						
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.021 U	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.040 U	0.042 U	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.021 U	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.021 U	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.021 U	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.021 U	0.020 U	0.0054 J	0.0051 J
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.021 U	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	ND	ND	0.0054 J	0.0051 J
						ND
Metals						
Magnesium	µg/L	24700	25900	30000	25700	29500
Cyanide (amenable)	µg/L	10 U	10 U	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U	10 U	10 U
Mercury	µg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00495
Sodium	µg/L	22600	22900	25100	25200	23700
						24100

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.

UJ - Not detected; associated reporting limit is estimated.

ND - Not detected at the associated reporting limit.

AMSL - Above mean sea level.

TABLE 2

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

Sample Location:	MW-108D	MW-108D	MW-108S	MW-109D
Sample Identification:	WG-56393-101413-MR-192	WG-56393-101413-MR-193	WG-56393-101413-MR-191	WG-56393-101413-MR-194
Sample Date:	10/14/2013	10/14/2013	10/14/2013	10/14/2013
Sample Type:		Duplicate		
Screen Depth:	Screen Depth: (40-45)	Screen Depth: (40-45)	Screen Depth: (2-9)	Screen Depth: (22-27)
Sample Elevation (feet AMSL):	663.39-618.39	663.39-618.39	701.32-692.32	689.41-666.41
Units				
Volatile Organic Compounds (VOCs)				
Acetone	µg/L	20 U	20 U	20 U
Benzene	µg/L	0.50 U	0.50 U	0.50 U
Bromodichloromethane	µg/L	0.50 U	0.50 U	0.50 U
Bromoform	µg/L	0.50 U	0.50 U	0.50 U
Bromomethane (Methyl bromide)	µg/L	0.50 UJ	0.50 UJ	0.50 UJ
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	20 U	20 U	20 U
Carbon disulfide	µg/L	0.50 U	0.50 U	0.50 U
Carbon tetrachloride	µg/L	0.50 U	0.50 U	0.50 U
Chlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Chloroethane	µg/L	0.50 U	0.50 U	0.50 U
Chloroform (Trichloromethane)	µg/L	0.50 U	0.50 U	0.50 U
Chloromethane (Methyl chloride)	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	2.0 U	2.0 U	2.0 U
Dibromochloromethane	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane (Ethylene dibromide)	µg/L	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane (CFC-12)	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	µg/L	0.14 J	0.12 J	0.50 U
1,2-Dichloroethane	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.12 J
trans-1,2-Dichloroethene	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	µg/L	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	µg/L	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	0.50 U	0.50 U	0.50 U
2-Hexanone	µg/L	20 U	20 U	20 U
Isopropyl benzene	µg/L	2.0 U	2.0 U	2.0 U
Methyl tert butyl ether (MTBE)	µg/L	0.50 U	0.50 U	0.50 U
4-Methyl-2-pentanone (Methyl Isobutyl ketone) (MIBK)	µg/L	20 U	20 U	20 U
Methylene chloride	µg/L	2.0 U	2.0 U	2.0 U
Styrene	µg/L	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	µg/L	0.50 U	0.50 U	0.50 U
Tetrachloroethene	µg/L	0.50 U	0.50 U	0.50 U
Toluene	µg/L	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	2.0 U	2.0 U	2.0 U
1,1,1-Trichloroethane	µg/L	0.11 J	0.11 J	0.50 U
1,1,2-Trichloroethane	µg/L	0.50 U	0.50 U	0.50 U
Trichloroethene	µg/L	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane (CFC-11)	µg/L	0.50 U	0.50 U	0.50 U
Vinyl chloride	µg/L	0.50 U	0.50 U	0.50 U
o-Xylene	µg/L	0.50 U	0.50 U	0.50 U
m&p-Xylenes	µg/L	0.50 U	0.50 U	0.50 U

TABLE 2

**ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

<i>Sample Location:</i>	<i>MW-108D</i>	<i>MW-108D</i>	<i>MW-108S</i>	<i>MW-109D</i>
<i>Sample Identification:</i>	<i>WG-56393-101413-MR-192</i>	<i>WG-56393-101413-MR-193</i>	<i>WG-56393-101413-MR-191</i>	<i>WG-56393-101413-MR-194</i>
<i>Sample Date:</i>	<i>10/14/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>	<i>10/14/2013</i>
<i>Sample Type:</i>		<i>Duplicate</i>		
<i>Screen Depth:</i>	<i>Screen Depth: (40-45)</i>	<i>Screen Depth: (40-45)</i>	<i>Screen Depth: (2-9)</i>	<i>Screen Depth: (22-27)</i>
<i>Sample Elevation (feet AMSL):</i>	<i>663.39-618.39</i>	<i>663.39-618.39</i>	<i>701.32-692.32</i>	<i>689.41-666.41</i>
<i>Units</i>				
PCBs				
Aroclor-1016 (PCB-1016)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1221 (PCB-1221)	µg/L	0.040 U	0.040 U	0.040 U
Aroclor-1232 (PCB-1232)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1242 (PCB-1242)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1248 (PCB-1248)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1254 (PCB-1254)	µg/L	0.020 U	0.020 U	0.020 U
Aroclor-1260 (PCB-1260)	µg/L	0.020 U	0.020 U	0.020 U
Total PCBs	µg/L	ND	ND	ND
Metals				
Magnesium	µg/L	27500	27000	26900
Cyanide (amenable)	µg/L	10 U	10 U	10 U
Cyanide (total)	µg/L	10 U	10 U	10 U
Mercury	µg/L	0.001 U	0.001 U	0.001 U
Sodium	µg/L	26800	26200	24600
				24700

Notes:

- U - Not detected at the associated reporting limit.
- J - Estimated concentration.
- UJ - Not detected; associated reporting limit is estimated.
- ND - Not detected at the associated reporting limit.
- AMSL - Above mean sea level.

TABLE 3

**ANALYTICAL METHODS AND HOLDING TIME CRITERIA
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

<i>Parameter</i>	<i>Method</i>	<i>Matrix</i>	<i>Holding Time</i> <i>Collection to Analysis</i> <i>(Days)</i>
Volatile Organic Compounds	SW-846 8260 ¹	Water	14
Polychlorinated Biphenyls	SW-846 8082 ¹	Water	40
Metals (Mg and Na)	EPA 200.7 ³	Water	180
Mercury	EPA 1631E ³	Water	28
Cyanide (Amenable)	SW-846 9012 ¹ /SM4500-CN-E ²	Water	14
Cyanide (Total)	SW-846 9012 ¹	Water	14

Notes:

SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, 1986, with subsequent revisions.

SM - "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, with subsequent revisions.

¹ - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, 1986, with subsequent revisions.

² - "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992, with subsequent revisions.

³ - "Methods for Chemical Analysis of Water and Wastes", USEPA-600/4-79-020, March 1983, with subsequent revisions.

TABLE 4

**QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013**

<i>Parameter</i>	<i>Analyte</i>	<i>Calibration Date</i>	<i>%D</i>	<i>Associated Sample ID</i>	<i>Qualified Result</i>	<i>Units</i>
TCL VOC	Bromomethane	10/24/2013	43	WG-56393-101413-MR-190	0.50 UJ	µg/L
				WG-56393-101413-MR-191	0.50 UJ	µg/L
				WG-56393-101413-MR-192	0.50 UJ	µg/L
				WG-56393-101413-MR-193	0.50 UJ	µg/L
				WG-56393-101413-MR-194	0.50 UJ	µg/L
TCL VOC	Carbon tetrachloride	10/27/2013	30	WG-56393-101513-MR-200	0.50 UJ	µg/L
				WG-56393-101513-MR-201	0.50 UJ	µg/L

Notes:

-- - Not applicable

%D - Percent difference

UJ - Not detected; associated reporting limit is estimated.

TCL - Target compound list.

VOC - Volatile organic compounds.

TABLE 5

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE METHOD BLANKS
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013

Parameter	Analyte	Analysis Date	Blank Result *	Sample ID	Original Result	Qualified Result	Units
TCL VOC	Chloroform (Trichloromethane)	10/25/2013	0.13 J	WG-56393-101513-MR-196	0.12 J	0.50 U	µg/L
				WG-56393-101513-MR-197	0.12 J	0.50 U	µg/L
				WG-56393-101513-MR-199	0.090 J	0.50 U	µg/L
TCL VOC	Carbon disulfide	10/27/2013	0.15 J	WG-56393-101513-MR-200	0.080 J	0.50 U	µg/L
				WG-56393-101513-MR-201	0.070 J	0.50 U	µg/L

Notes:

* - Blank result adjusted for sample factors where applicable.

U - Not detected at the associated reporting limit.

J - Estimated concentration.

TCL - Target compound list.

VOC - Volatile organic compounds.

TABLE 6

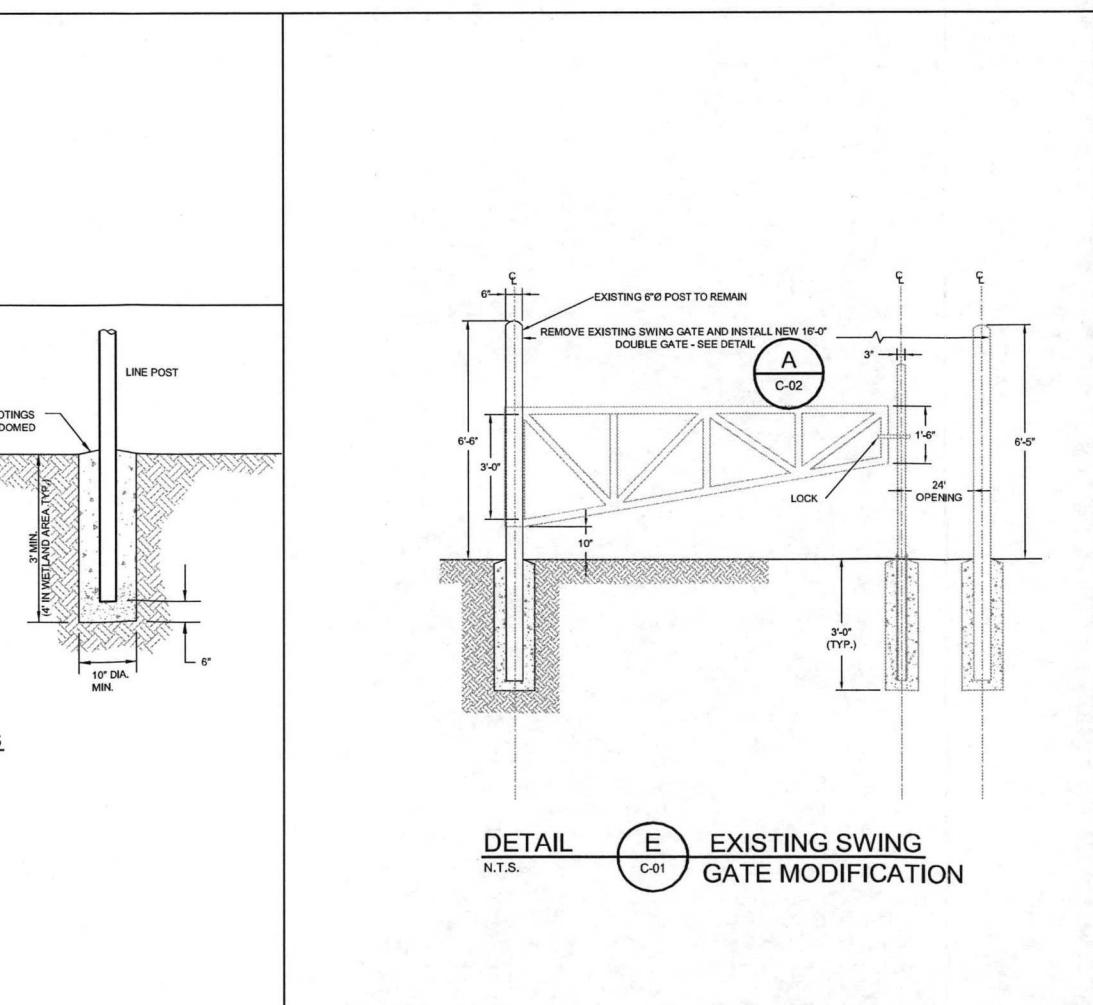
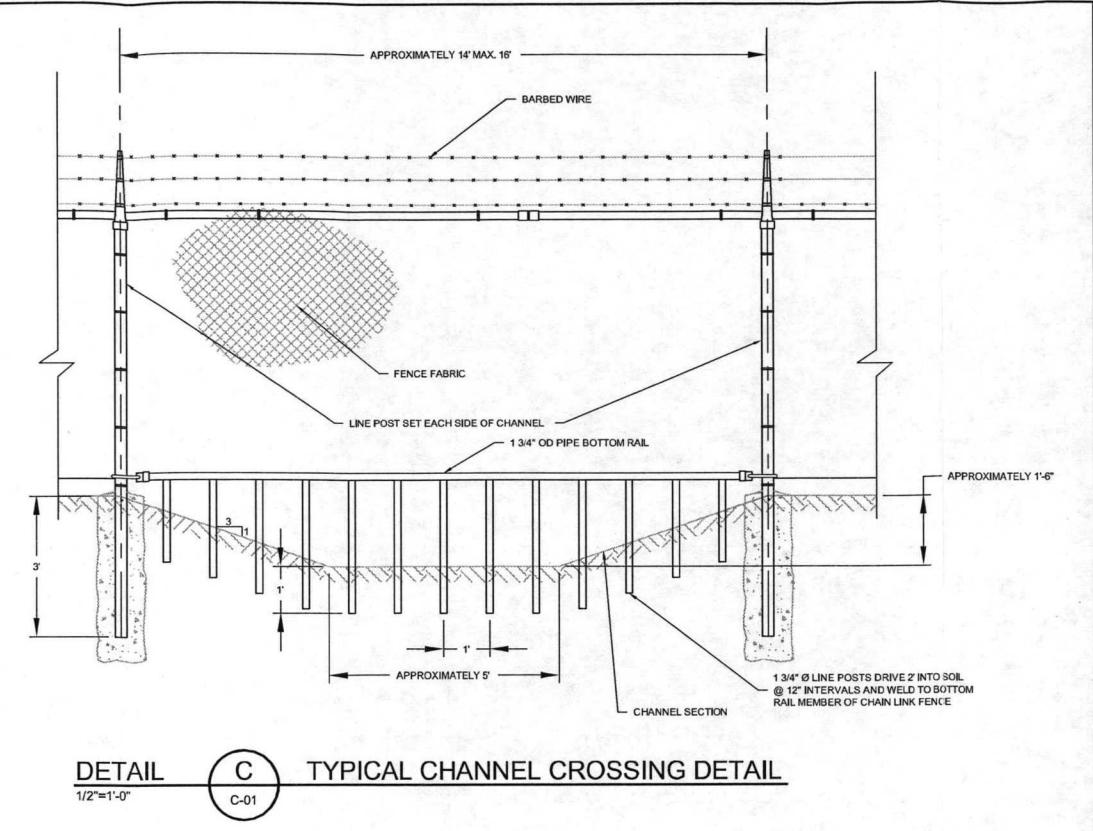
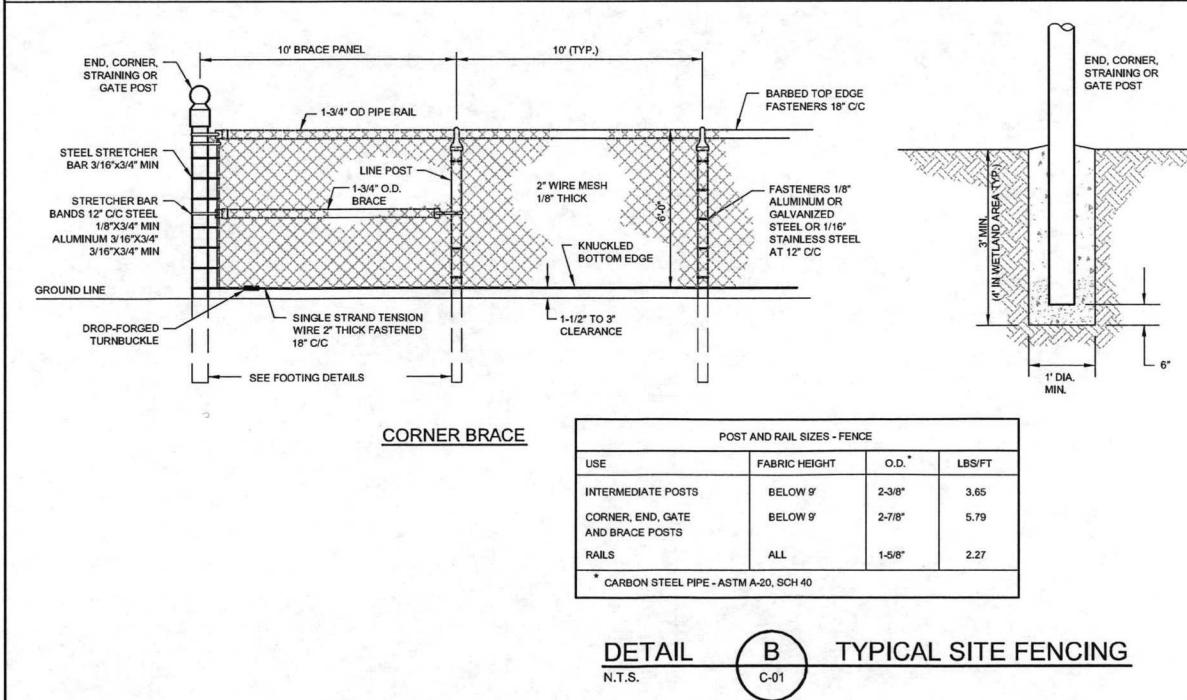
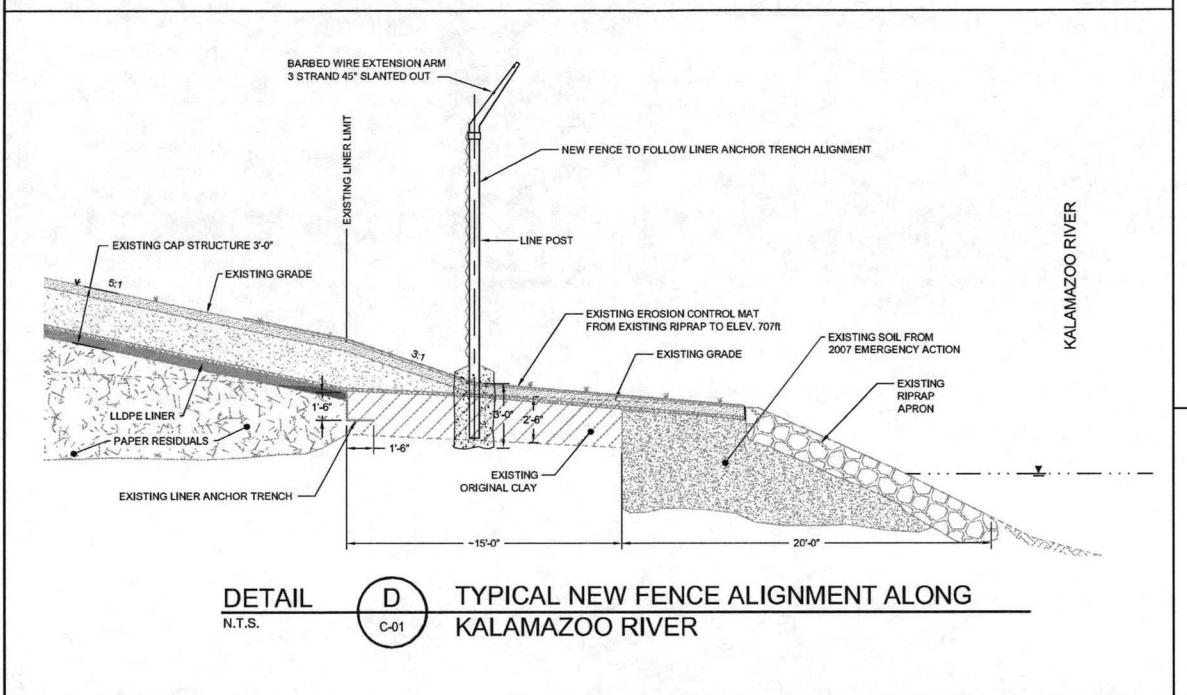
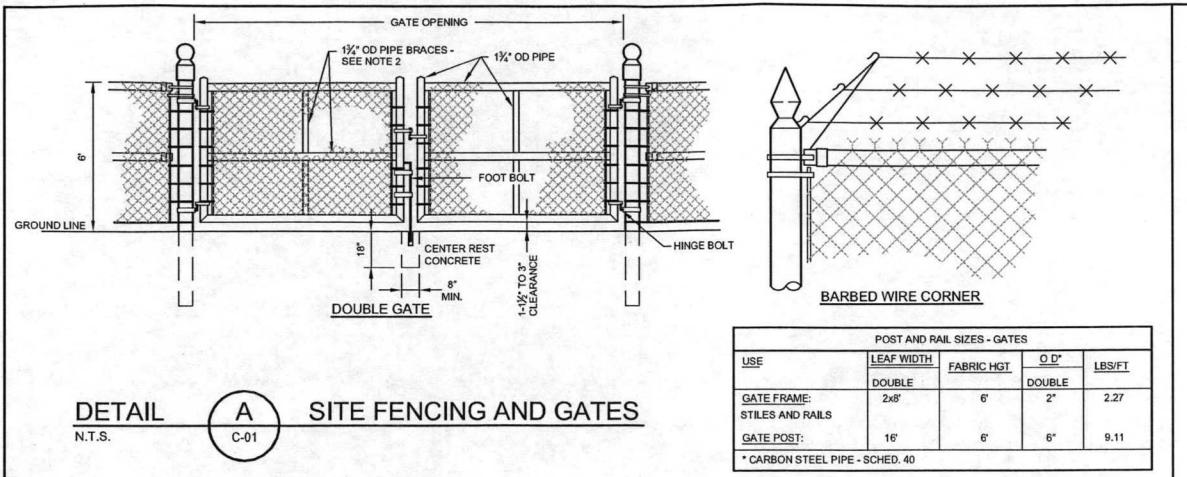
QUALIFIED SAMPLE DATA DUE TO ANALYTE CONCENTRATIONS IN THE TRIP BLANKS
GROUNDWATER MONITORING
12TH STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN
OCTOBER 2013

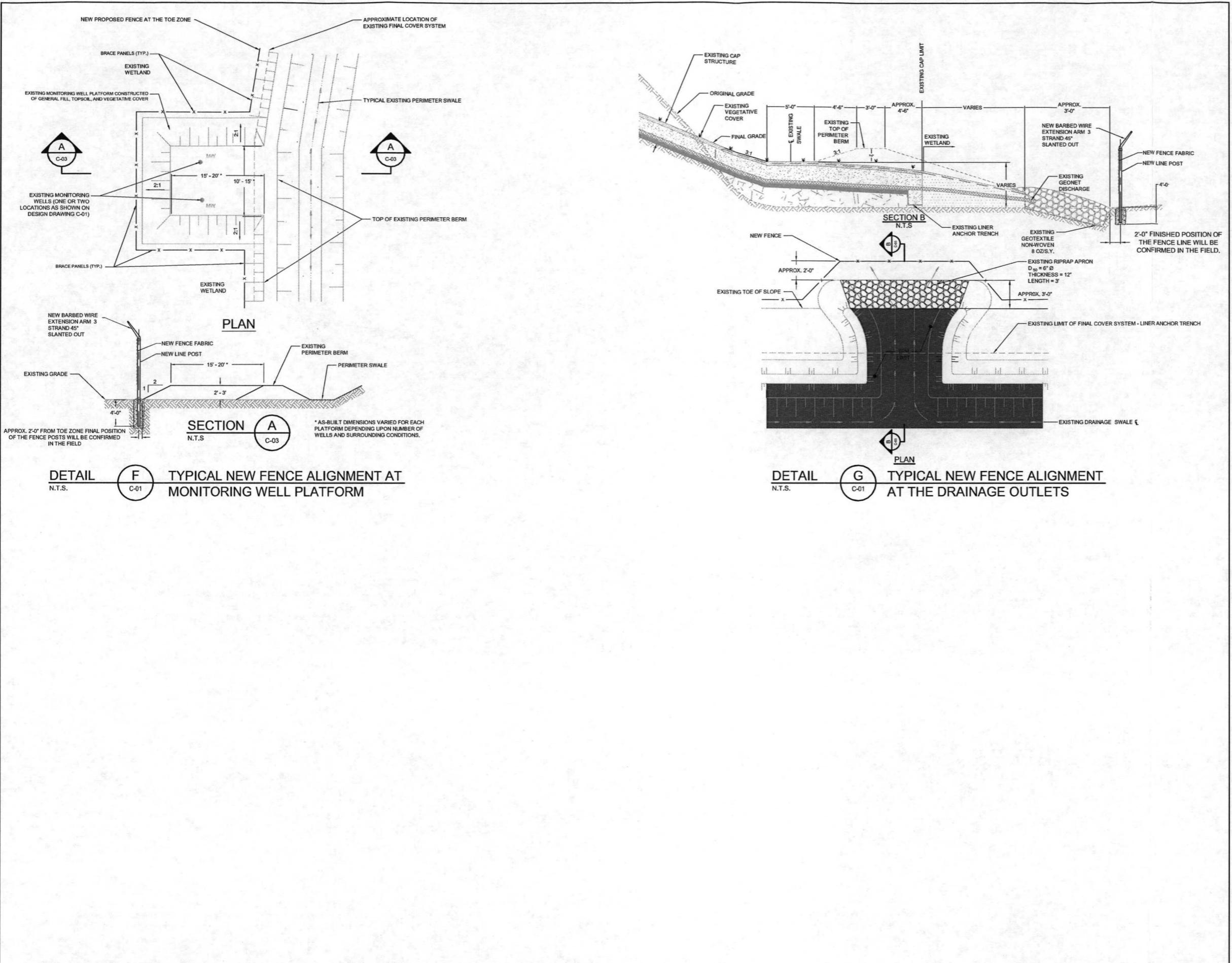
Parameter	Blank Date	Analyte	Blank Result	Associated Sample ID	Original Result	Qualified Result	Units
Mercury	10/16/2013	Mercury	0.27 J	WG-56393-101413-MR-190	0.32 J	1.0 U	ng/L
				WG-56393-101413-MR-191	0.34 J	1.0 U	ng/L
				WG-56393-101413-MR-192	0.43 J	1.0 U	ng/L
				WG-56393-101413-MR-193	0.50 J	1.0 U	ng/L
				WG-56393-101413-MR-194	0.42 J	1.0 U	ng/L
				WG-56393-101513-MR-195	0.55 J	1.0 U	ng/L
				WG-56393-101513-MR-196	0.08 J	1.0 U	ng/L
				WG-56393-101513-MR-197	0.14 J	1.0 U	ng/L
				WG-56393-101513-MR-198	0.11 J	1.0 U	ng/L
				WG-56393-101513-MR-200	0.14 J	1.0 U	ng/L
				WG-56393-101513-MR-201	0.18 J	1.0 U	ng/L
				WG-56393-101613-MR-202	0.15 J	1.0 U	ng/L
				WG-56393-101613-MR-204	0.31 J	1.0 U	ng/L
				WG-56393-101613-MR-205	0.43 J	1.0 U	ng/L

Notes:

U - Not detected at the associated reporting limit.

J - Estimated concentration.





SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

BRAUNING BRAUNIG

ISSUED FOR REVIEW

JUNE 2013

ISSUED FOR REVIEW

Page 1

12th STREET LANDFILL
Otsego Township, Michigan

PERIMETER FENCING

TYPICAL DETAILS 2



BA ENGINEERING INC

Source Reference:

— 10 —

Digitized by srujanika@gmail.com

— 1 —

Project Manager:

Reviewed By: _____ Date: _____

ate: